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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

July 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Medical Electronics Engineering **Duration: 3 hrs.**
Course Code: 22MD5PCSGP **Max Marks: 100**
Course: SIGNAL PROCESSING

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		Define with examples: (i.) Signal, (ii.) System.	CO1	PO1	**02**
	b)		Describe the different properties of systems.	CO1	PO1	**08**
	c)		Consider the analog signal : $x_a(t) = 3\cos(100\pi t)$ (i) Determine the minimum sampling rate required to avoid aliasing. (ii) Suppose that the signal is sampled at the rate Fs = 200 Hz. What is the discrete-time signal obtained after sampling? (iii) Suppose that the signal is sampled at the rate Fs ~ 75 Hz. What is the discrete time signal obtained after sampling?	CO2	PO2	**10**
			UNIT - II			
2	a)		Find the DTFT of the sequence given i) $X(n)=2(3)^n+u(-n)$ **ii)** $X(n)=a^n$ $a<1$	CO3	PO3	**10**
	b)		Obtain the relationship between DFT and Z transform	CO3	PO3	**10**
			OR			
3	a)		Compute the circular convolution using DFT and IDFT method for the following sequences: $\mathbf{x_1(n) = \{1, 2, 3, 1\}}$ and $\mathbf{x_2(n) = \{4, 3, 2, 2\}}$	CO3	PO3	**10**
	b)		Compute the N – point DFT of the following signals : (i) $x(n)= \delta(n-n0)$; $0 < n0 < N$ (ii) $x(n) = a^n$; $0 \le n \le (N-1)$	CO3	PO3	**10**
			UNIT - III			
4	a)		Develop radix – 2, DIT – FFT algorithm and write signal flow graph for $N = 8$.	CO3	PO3	**10**

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		b)	Using DIT-FFT algorithm compute the DFT of a sequence x[n]=[1,1,1,1,0,0,0,0]	*CO3*	*PO3*	**10**
			UNIT - IV			
	5	a)	Distinguish between FIR and IIR filters.	*CO2*	*PO2*	**10**
		b)	Design a digital band stop Butterworth filter with the following specifications: Center frequency of 2.5 kHz Passband width of 200 Hz and ripple of 3 dB Stop band width of 50 Hz and attenuation of 10 dB Sampling frequency of 8000 Hz	*CO3*	*PO3*	**10**
			UNIT - V			
	6	a)	Design a Butterworth high pass filter that will meet the following specifications: Maximum passband attenuation: 2dB Passband edge frequency: 200 rad/sec Minimum stopband attenuation: 20dB Stopband edge frequency: 100 rad/sec	*CO3*	*PO3*	**10**
		b)	Obtain cascade realization of system : $\boldsymbol{H(z) = (2Z^{-1} - Z^{-2})(Z^{-1} - Z^{-2})}$	*CO2*	*PO2*	**10**
			OR			
	7	a)	Realize the FIR filter whose transfer function is given by $\mathbf{H(z) = 1 + \frac{3}{4}Z^{-1} + \frac{17}{8}Z^{-2} + \frac{3}{4}Z^{-3} + Z^{-4}}$ Using direct form 1	*CO3*	*PO3*	**10**
		b)	A low pass filter is to be designed with the following desired frequency response: $H_d(w) = \begin{cases} 1, & \text{for } \lvert w\rvert \le \pi/6 \\ 0 & \text{for } \pi/6 \le \lvert w\rvert \le \pi \end{cases}$ Determine the coefficients of a 7 – tap filter based on the window method with the Hamming window.	*CO3*	*PO3*	**10**

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